Update on Charm/Bottom Separation

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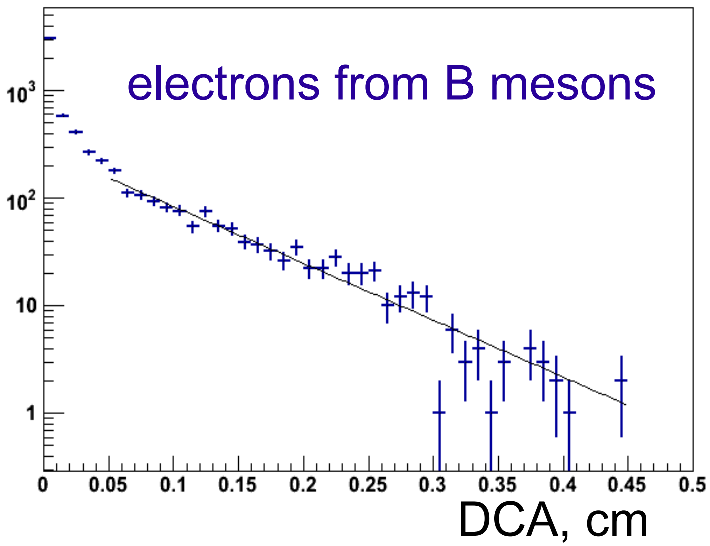
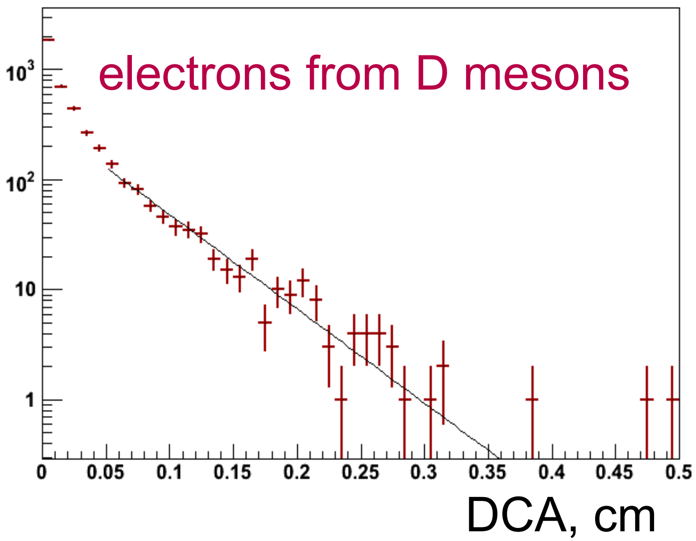
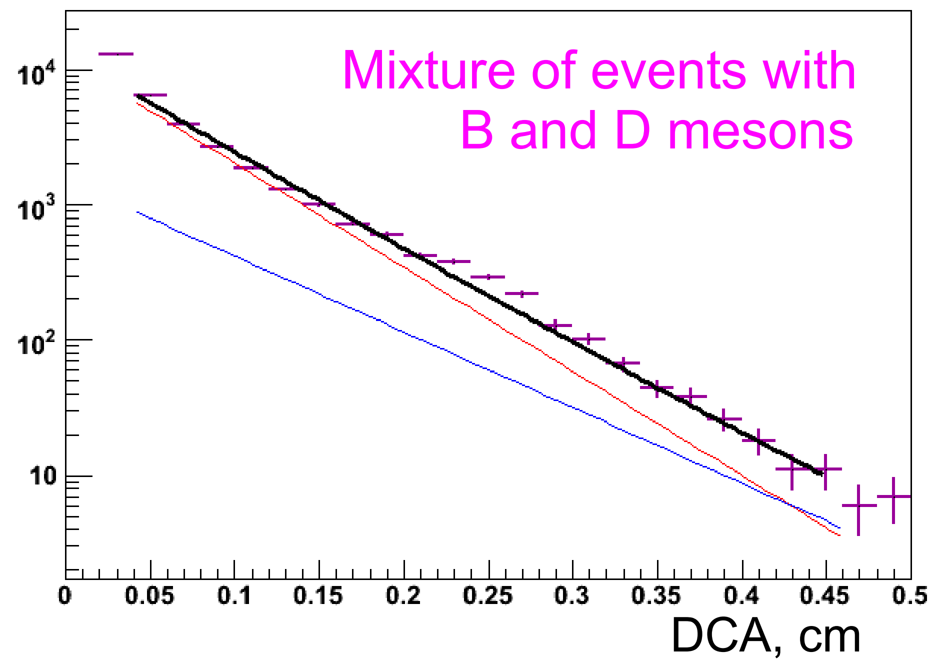
Reminder

- Embed electrons from B and D meson decays in p+p PYTHIA events
- Run full simulation and reconstruction, DCA from Kalman Fit.
- Fit DCA distributions for charm and bottom separately with an exponential for each pT bin, obtain slopes.
- Mix events with charm and bottom, fit DCA distribution for the mixture with two exponentials with the slopes from previous step (for each p_T bin).







What is new?

The problem with this approach is that you need to know what is DCA slope for B mesons and for D mesons separately, before you attempt the separation.
If we try to predict the slopes from a separate simulation of B and D mesons, we need to know p_T distribution for B and D mesons.
If you use wrong p_T distribution, this procedure does not work.

New approach: predict DCA slopes for B and D from a measurement.

DCA slopes can be predicted from one measurement of DCA slope for the charm/bottom mixture at low p_T (where it is close to DCA slope for charm).

This works for different data sets with different p_T distributions.
No need to know in advance DCA slopes for B and D mesons, they can be predicted from a measurement!

The Procedure

- Measure DCA slope in 1-2 GeV p_T bin for the charm+bottom mixture, call it S_O.

- From this number, for a given p_T bin, calculate DCA slopes for charm and bottom like this:

$$S_{CHARM} = 1.1\ S_O\ \mathrm{pow}(p_T,0.1)$$
$$S_{BOTTOM} = 1.1\ S_O\ \mathrm{pow}(p_T,0.1)\ /\ 1.5$$

- In a given p_T bin, fit DCA distribution for the B+D mixture by:

$$[0]*\exp(-DCA*S_{CHARM}) + [1]*\exp(-DCA*S_{BOTTOM})$$

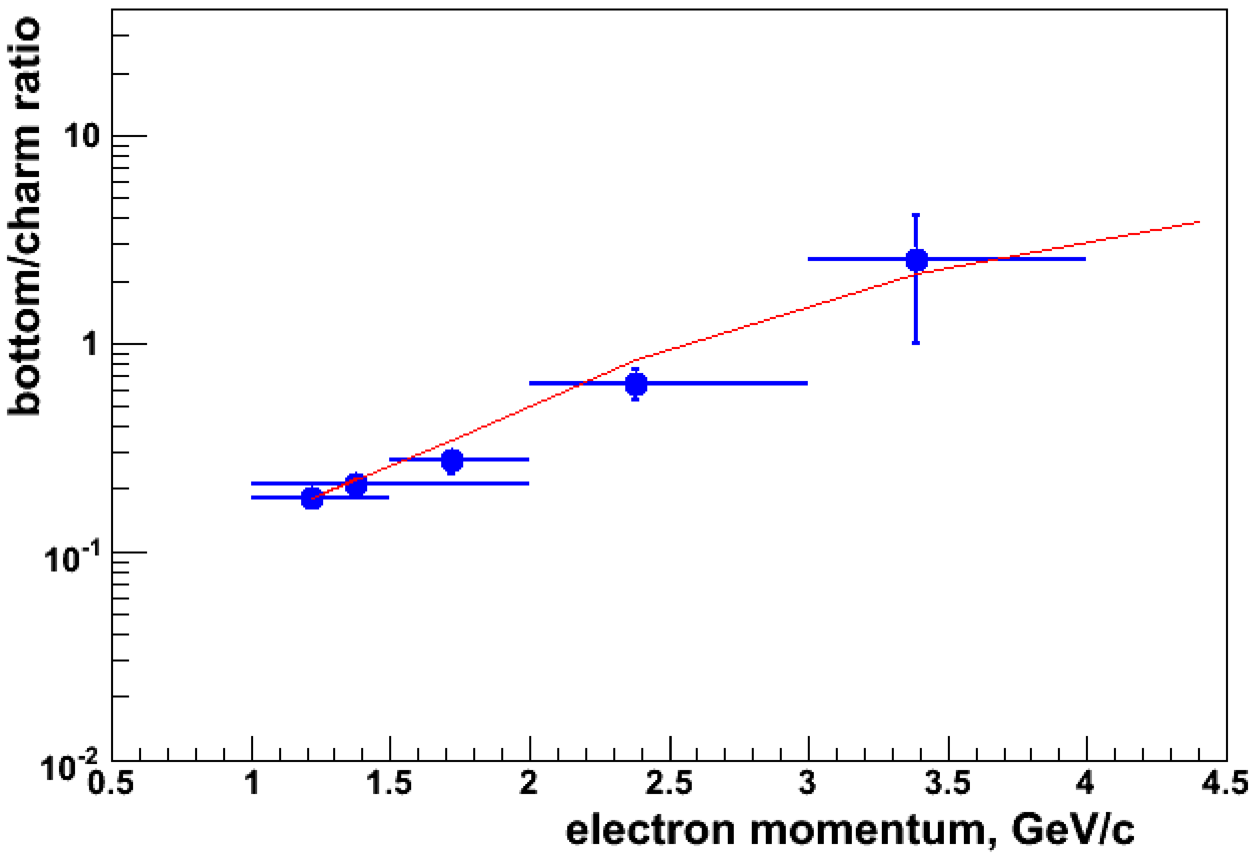
- Ratio of fit parameters [1] and [0] is bottom/charm ratio in this p_T bin.

  Examples of separation are shown in the following slides.

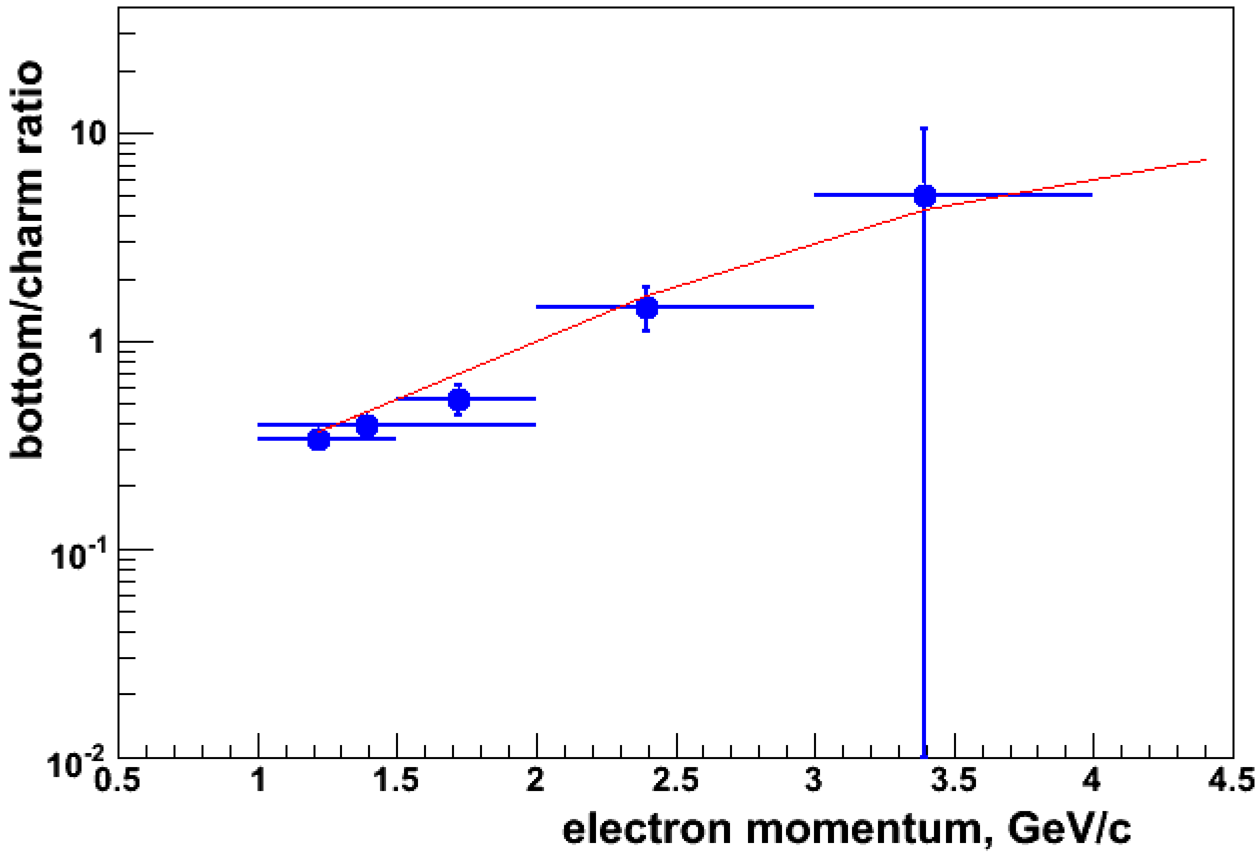
Example of Separation (Dataset 1)

Red – true bottom/charm ratio
Blue – reconstructed bottom/charm ratio

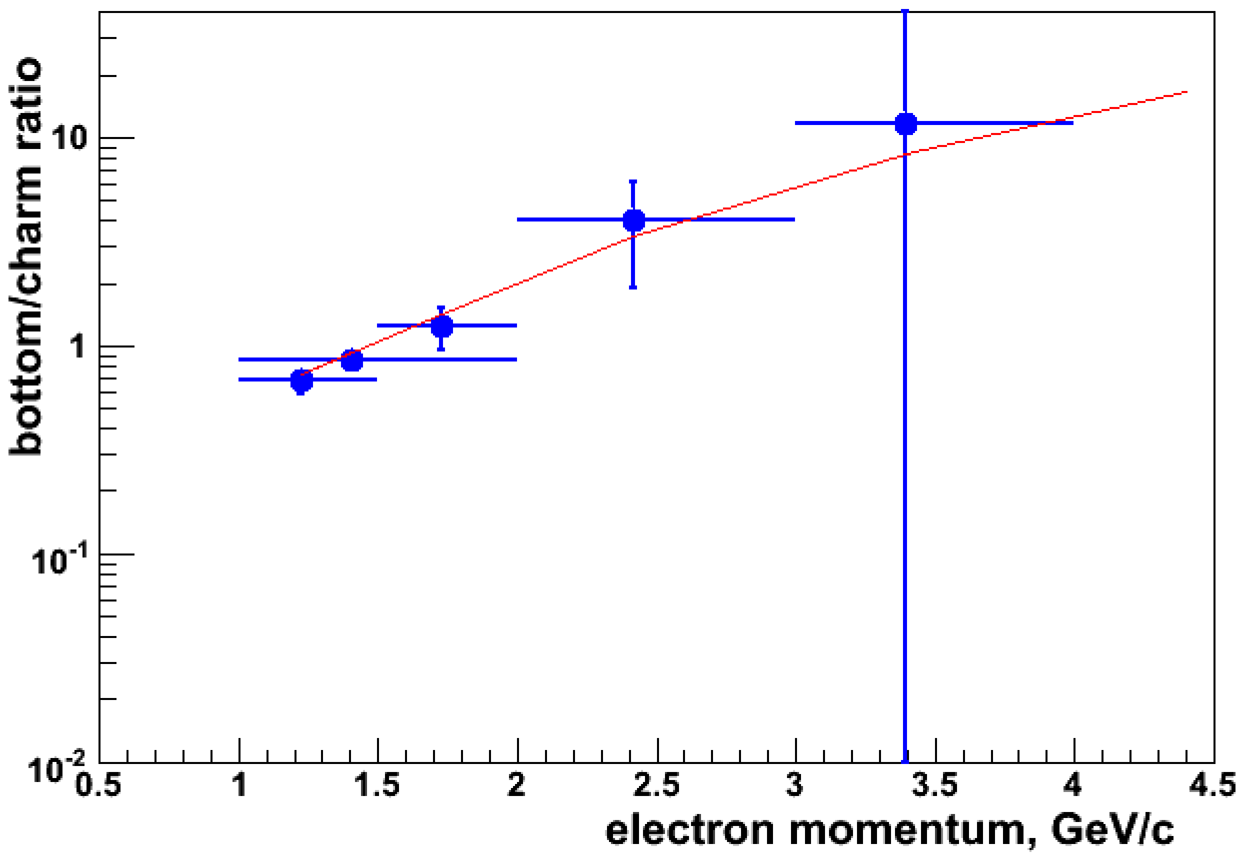
Horizontal error bars indicate bin width, vertical error bars fit errors



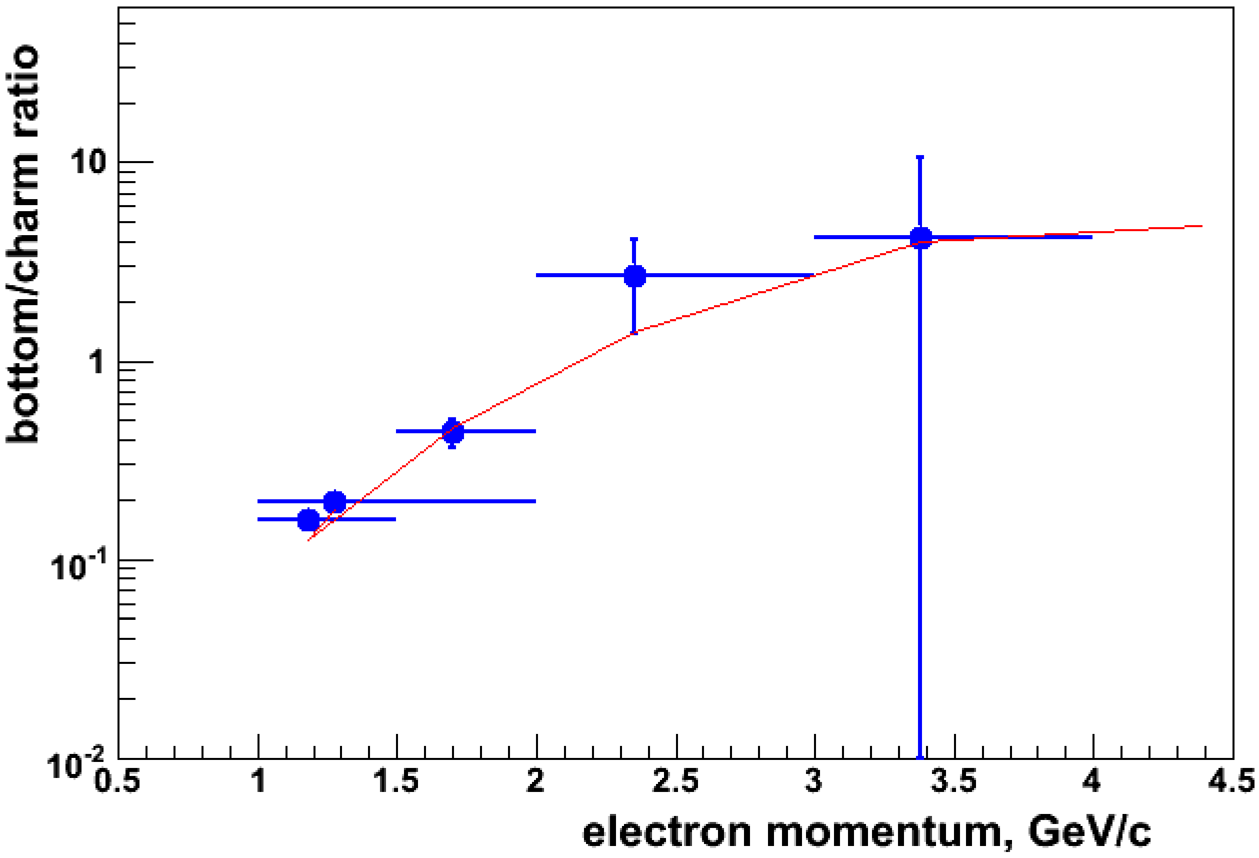
Example of Separation (Dataset 1)



Example of Separation (Dataset 1)

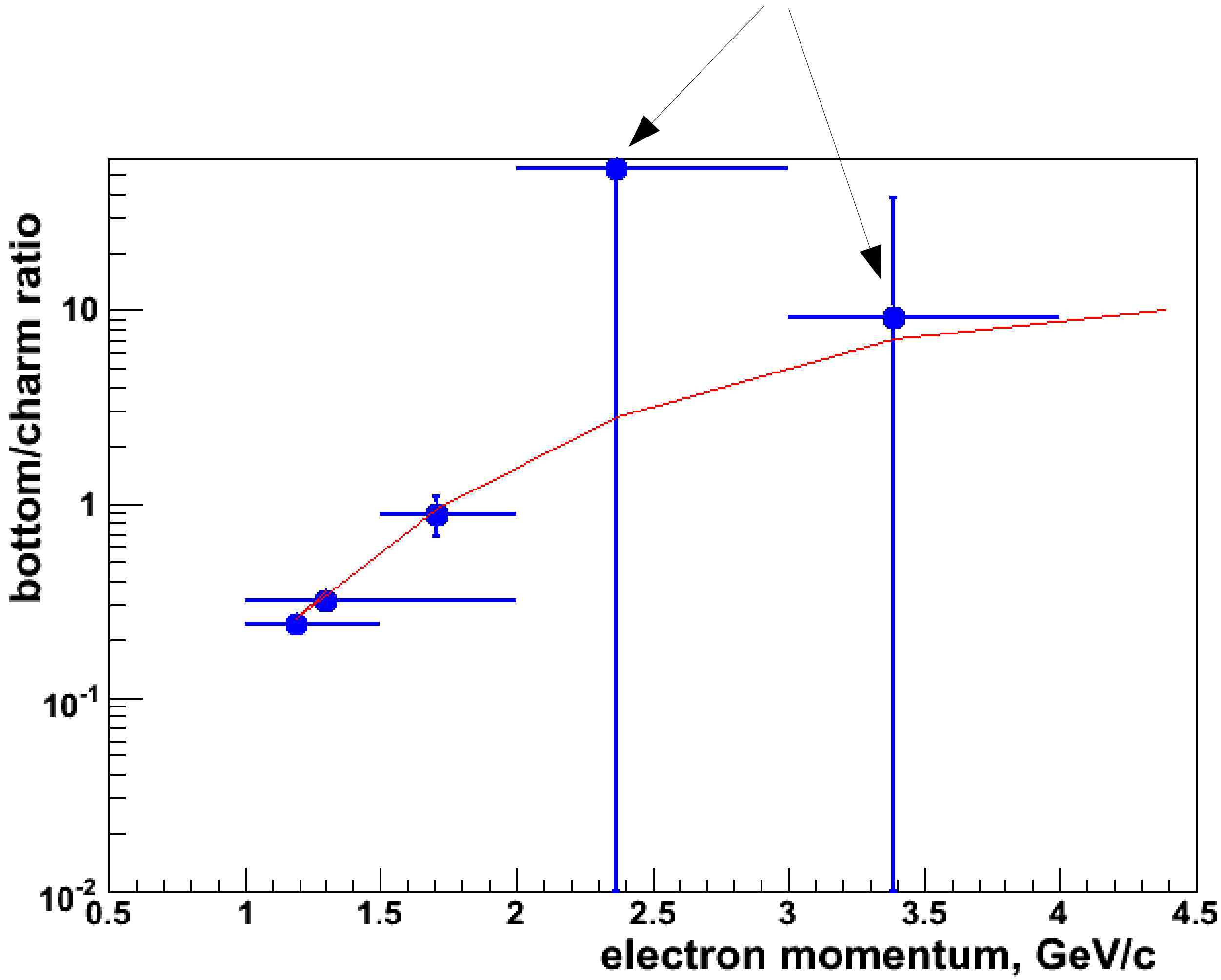


Example of Separation (Dataset 2)



Example of Separation (Dataset 2)

The procedure requires good statistics.
Without it, fitting does not work.



Summary and Plans

- The procedure seems to work well for two data sets (min. bias and ckin(3)=3GeV).

- Should try it for some other datasets, also would be good if someone else tried to use it.

- Blind analysis?

The code for this analysis is in cvs:
offline/analysis/run7_jpsi_isu/AnaAnalysis.cc
offline/analysis/run7_jpsi_isu/work/plot/plotbdsepnew.C

I will create documentation at VTX Wiki page:
https://www.phenix.bnl.gov/WWW/offline/wikioffline/index.php/VTX_%28SVX%29